

Norman Beard

The World of Number



DISCOVERY PROGRAMMES

The World of Number

This programme has the following test record:

First tested with 38 children in 5 schools (ages ranging from 9 years 10 months to 11 years 4 months)

Overall frame error rate = 6.4%

Final test with 93 children in 6 schools (ages ranging from 9 years 9 months to 13 years 1 month)

Overall frame error rate = 2.8%

Average gain after completion = 77.8%

1845 (49/7)

DISCOVERY PROGRAMMES

General Editor: John Leedham, M.Ed.

The world of number

Norman Beard

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Illustrated by R. Paul-Hoye

Maps by Ric Wylam



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frames 4, 5, 6 and 22 which are by the author.

Titles in this series will include

THE AIR WE BREATHE by John Leedham

A FIRST BOOK OF SETS

A SECOND BOOK OF SETS } by John Clarke

THE GEOMETRY OF THE POINT AND LINE

by Cyril Harries

AREA AND VOLUME by John Leedham and D. V. Parker

DON'T SMOKE! by R. W. Kind and John Leedham

THE SCARLET RUNNER by John Fieldhouse

A FIRST BOOK OF FRACTIONS

A SECOND BOOK OF FRACTIONS

UNDERSTANDING NUMBER BASE

PLACE VALUE

UNDERSTANDING AND USING A

CONTOUR MAP by Kathleen Brooks

} by John Clarke

Printed in Great Britain by Lowe & Brydone (Printers) Ltd.

1845

Introducing Discovery Programmes

Discovery Programmes are programmed books developed by practising teachers. They seek to introduce fresh material, or to put forward traditional material in a new way; they are intended to be a real adjunct to the work of the teacher. All have been carefully tested and have proved their worth under classroom conditions. The texts require a reading age of 10·4 or above; no previous knowledge of their subjects is needed.

Discovery Programmes are the fruit of experiments in programmed learning carried out by a group of teachers in the Leicestershire Education Authority. Our programmes were tested and retested in many schools in the locality, and the editor would like to express his appreciation of the help provided by the Director and Committee of the Leicestershire Education Authority.

“Programmed Learning is one of the most important new tools teachers have at their disposal. We are only at the beginning of exploring its full potential and I certainly will not attempt to guess how far it will take us. The important thing is to realise that it is a tool to be used by the teacher and not a substitute for him. A programme has the merit of infinite patience and it gives its undivided attention to the child who is using it. If it is a good one, it is subtle in providing the right doses of motivation.”

Stewart C. Mason, M.A.
Director of Education, Leicestershire



To the Teacher

This programme gives a short history of number.

The early frames test the range of the pupil's **NUMBER SENSE** and he becomes familiar with the meaning of this term. Man's use of **GROUP NAMES** as a further development of number sense is emphasised when the pupil uses modern group names in familiar situations, and an account is given of man's development of **ONE TO ONE CORRESPONDENCE** with consolidative work for the pupil to carry out. The difference between **ORDINAL** and **CARDINAL** number is explained and there are test situations to show that the pupil understands the difference. The pupil will be shown the use of different **BASES** in the manipulation of **NUMBER SYSTEMS** and be required to work out transfer values in varying bases.

A brief account is given of the **EGYPTIAN**, **SUMERIAN**, and **SYRIAC** number systems; knowledge of these three number systems is emphasised by maps and the writing of the number systems by the pupil. Some early recording and counting apparatus is illustrated, and the pupil will become familiar with **CHINESE BAMBOO RODS**, **QUIPU** and simple **ABACUS**. An account is given of the origin of the **DECIMAL SYSTEM** and its development, with an explanation of **PLACE VALUE**.

Revision frames are given in the programme itself and a post test on completion of the programme. The post programme work widens the pupil's scope in this field and should be used in conjunction with the programme.

To the Pupil

This is a programme. This is how it works:

- 1 Cut a piece of cardboard or paper just long enough and wide enough to cover this page from top to bottom and side to side, including the coloured margin.
This we call a *mask*.
Place it over the frame below this one.
Now write down in your notebook the answer to this question.
Is the coloured margin on the right—
 $1\frac{1}{2}$ miles wide? $1\frac{1}{2}$ inches wide?
To find out if you are right, pull down the mask until you can just see the answer printed in the margin.

- 2 Mark your answer. Your answer should always be written down before you check it.
This is because we **LE**N** better if we try on our own.
Write down the word.
Move down the mask.

- 3 Check your answer.
Now you know how to use the programme.

$1\frac{1}{2}$ INCHES

LEARN

Before you read and answer any question, be sure that the next frames are covered by your mask

- 1 Both primitive man and other creatures had a sense of number.

Was primitive man the only creature with a sense of number?

ANSWER

- 2 Primitive man could use ideas of number better than animals.

Which has the better idea of number today—

- (a) a man?
(b) a horse?

- 3 Man raised himself above other creatures when he DEVELOPED HIS NUMBER SENSE.

What did man develop to raise himself above other creatures regarding number?

- 4 The next few frames will illustrate NUMBER SENSE.
Can you say how many boats are here *without counting or grouping them*?



HIS NUMBER
SENSE

- 5 Can you say how many boys are here *without counting or grouping them*?



YES (TWO OR 2)

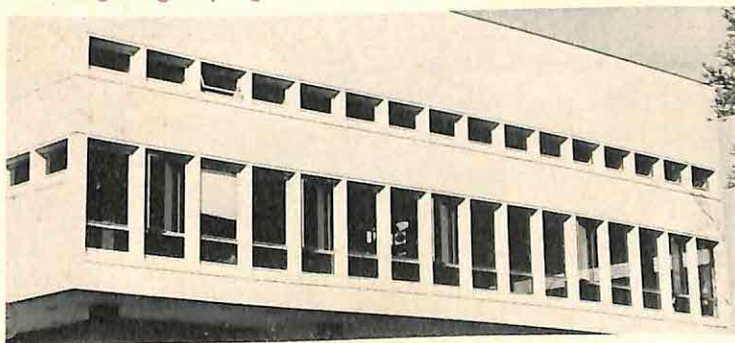
6



- Can you say how many steps are here *without counting or grouping them*?

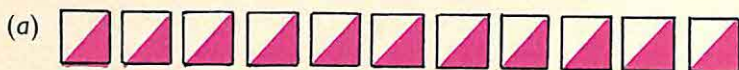
YES (THREE OR 3)

- 7 Can you say how many windows are here *without counting or grouping them*?



NO

- 8 Which of these things will your number sense recognise?



7
NO

- 9 Your n * * * * s * * * * recognises this number of objects



but not this number of objects.

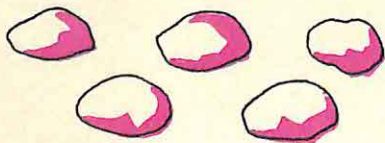


- 10 What do you rely on to recognise a small number of objects together, without counting them—

- (a) smell?
(b) touch?
(c) number sense?

9
NUMBER
SENSE

- 11 Primitive man knew “one” and “two” things but more than two things he called OTHER.
What would primitive man have called these things?



10
(c) NUMBER
SENSE

- 12 Sometimes man gave these "other" things
GROUP NAMES.
 Today we say a "pack of wolves" and a "***** of grapes".

11
 OTHER

- 13 We use the **GROUP NAME** "herd" for a lot of
 c_____.

12
 BUNCH

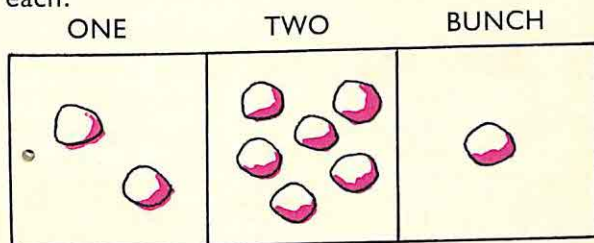
- 14 The **GROUP NAME** used for a lot of sheep is f*****.

13
 CATTLE
 OR COWS

- 15 We say a "pack of wolves".
 The word PACK is a g***** n*****.

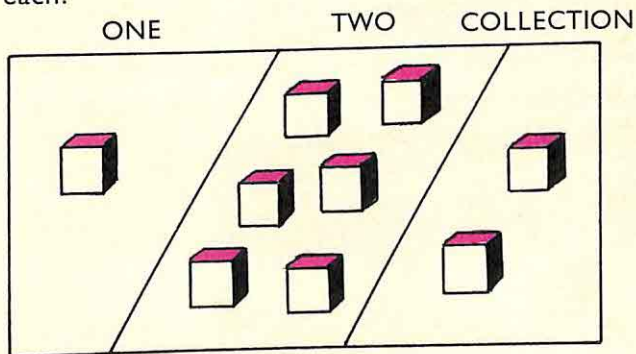
14
 FLOCK


- 16 Draw these pictures and put the correct name under each.



15
 GROUP
 NAME

- 17 Draw these pictures and put the correct name under each.

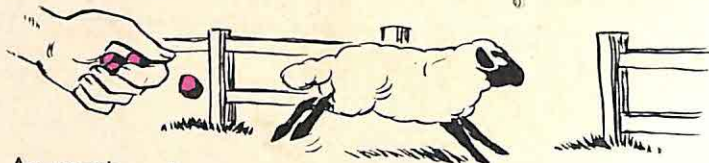


16

 TWO BUNCH ONE

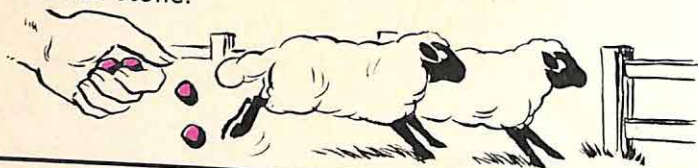
- 18 We say a "fleet of ships". Is the word "fleet" a—
(a) grand name?
(b) number sense?
(c) group name?



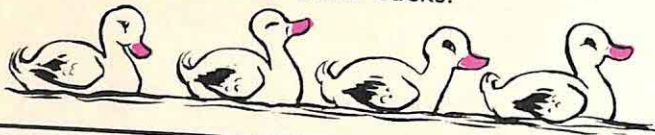
- 19 Man realised that he could make a record of each thing he had by using a stone.
As one sheep passed through a gate man dropped one of his stones.



As another sheep passed through the gate he dropped another stone.



- 20 Man matched his sheep with a number of stones.
Draw stones to match these ducks.



- 21 Do these cups match with these saucers?



22 Do these children match these bicycles?



22
NO

23 This matching is called a **ONE TO ONE CORRESPONDENCE**.
Write the words **ONE TO ONE CORRESPONDENCE**.

23
YES

24 When we match one thing with another like this:



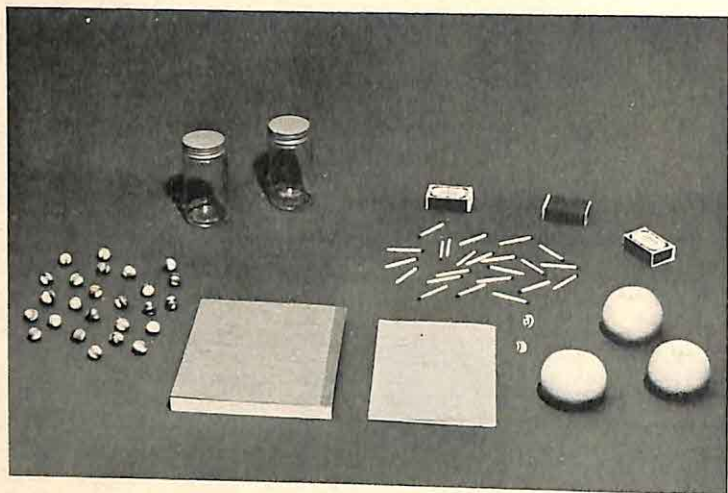
we call it a _____.

24
ONE TO ONE
CORRESPONDENCE

25 Is there a one to one correspondence here?



25
ONE TO ONE
CORRESPONDENCE



- 26 What name do we give to your ability to recognise the number of jars and the number of match-boxes in the picture, but not the number of matches?

25
YES

- 27 Which of these things in the picture will your number sense recognise—
 (a) books?
 (b) marbles?
 (c) apples?

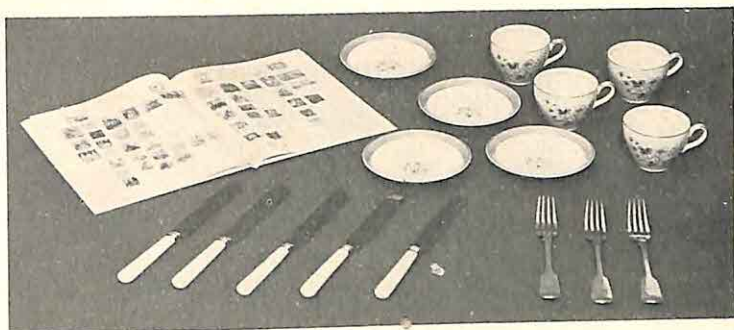
26
NUMBER
SENSE

- 28 We say a "flock" of sheep and a "herd" of cattle. The words FLOCK and HERD are _____.

27
(a) BOOKS
(b) APPLES

- 29 What group name do we give to a lot of stamps—
 (a) regiment?
 (b) collection?
 (c) fleet?

28
GROUP
NAMES



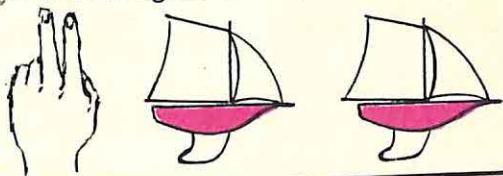
- 30 The cups in the picture match with the saucers.
We call this matching a one to one correspondence.

29
(b) COLLECTION

- 31 Is there a one to one correspondence between the knives and forks in the picture?

30
ONE TO ONE
CORRESPONDENCE

- 32 Man used his fingers to make a one to one correspondence.
Do these fingers correspond with these ships?



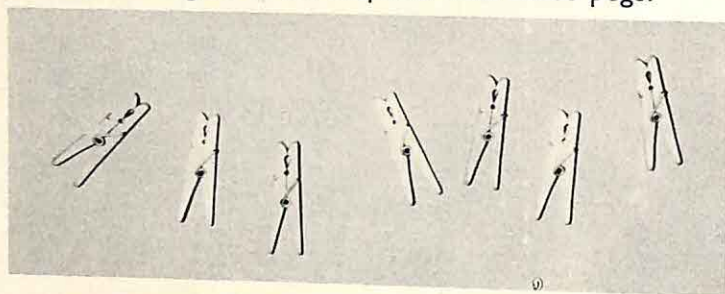
31
NO

- 33 Raise your fingers to correspond with these daffodils.



32
YES

- 34 Raise your fingers to correspond with these pegs.



- 35 Man gave number names to fingers that represented a number of objects.



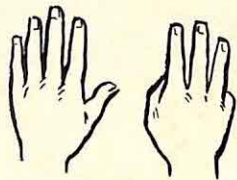
Is the number name we give to this set of fingers—

- (a) two?
- (b) seven?
- (c) three?

- 36 What number name do we give to this set of fingers?



- 37 What number name do we give to this set of fingers?



35
(c) THREE

36
FIVE

38 Raise two fingers.

37
EIGHT

39 Raise six fingers.



40 If we say "four" we mean a set of
 things. They can be



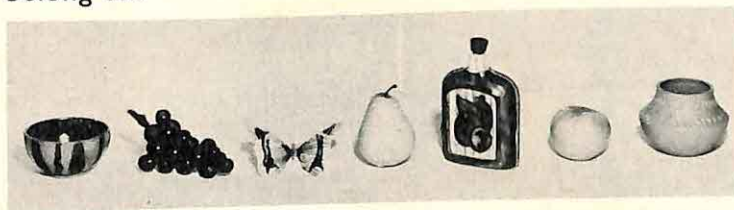
Here is a set of * * * * * houses.



41 The NUMBER NAME given to a set of things is
CARDINAL number.
Write down the word CARDINAL.

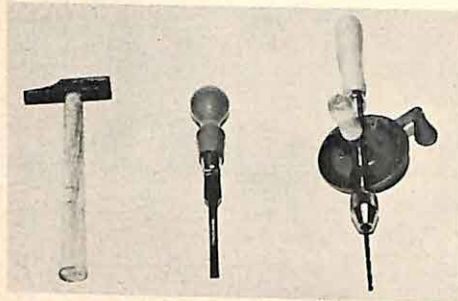
40
THREE

42 What CARDINAL number does this set of things
belong to?



41
CARDINAL

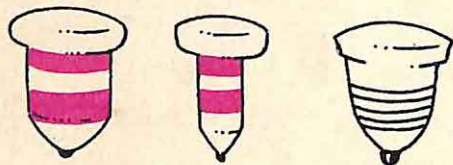
- 43 What **CARDINAL** number does this set of things belong to?



- 44 Draw circles belonging to the set of cardinal number SIX.

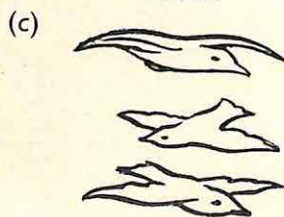
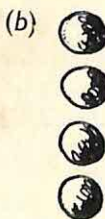
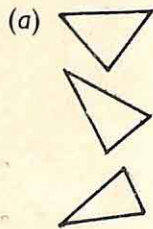
- 45 Draw crosses belonging to the set of cardinal number TWELVE.

- 46 The name THREE is given to this set of tops.



Is the word THREE a **CORRESPONDING** or **CARDINAL** name?

- 47 Which of these does not belong to cardinal three?



42
SEVEN

43
THREE

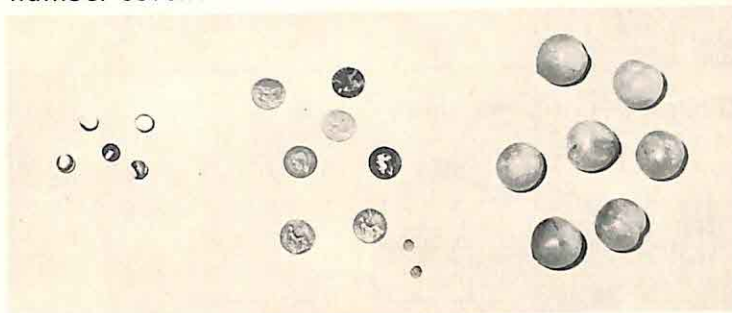
44
○○○○○○

45
++++
++++
++

46
CARDINAL

48

Which of these does not belong to the cardinal number seven?



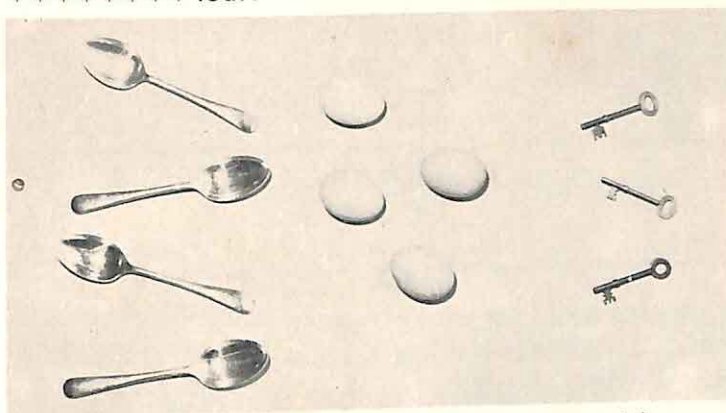
(a)

(b)

(c)

49

Set (c) below does not belong to the set of
***** four.



(a)

(b)

(c)

50

The **CARDINAL** name for the set of days in the week is SEVEN and that for the set of months in a year

*****.

51

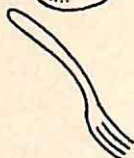
The set of days in a year is three hundred and sixty-five. Three hundred and sixty-five is a
C***** number name.

47
(b)48
(a)49
CARDINAL50
TWELVE

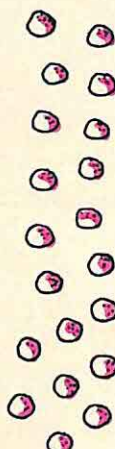
- 52 Tim is nine and Sally is twelve.
 Nine and twelve are both **c** * * * * * **n** * * * * *
n * * * * .

51
 CARDINAL

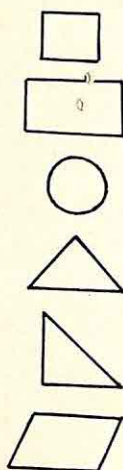
- 53 Give the cardinal number names for these sets of things.



(a)



(b)



(c)

52
 CARDINAL
 NUMBER
 NAMES

- 54 Ten, sixteen, forty-five and eighteen are _____ number names, but tenth, sixteenth, forty-fifth and eighteenth are not.

53
 (a) FOUR
 (b) TWENTY
 (c) SIX

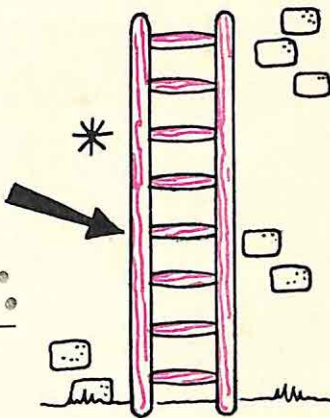
- 55 Pick out the cardinal number names from these and write them—
 (a) one;
 (b) first;
 (c) fifteen;
 (d) twenty-second;
 (e) ninety-two.

54
 CARDINAL

- 56 An object can also be spoken of in an order of things.

This is the FOURTH rung.

Is the rung marked * the—
(a) third?
(b) sixth?
(c) second?

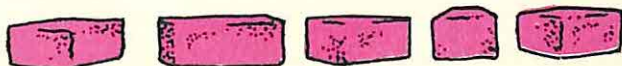


- 57 The **NUMBER NAME** given to an object according to its position in an *order* of objects is **ORDINAL** number. Write down the word **ORDINAL**.

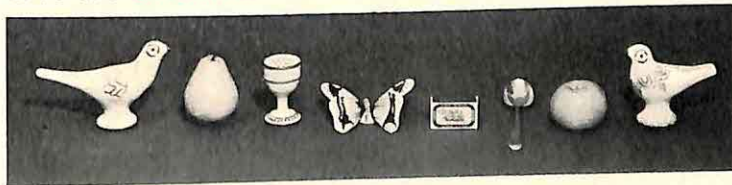
- 58 The **ORDINAL** name for the last object of this set is "fourth".



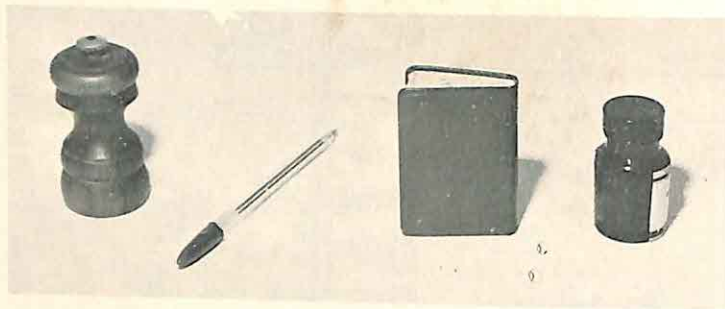
What is the **ORDINAL** name for the last object of this set?



- 59 Give the **ORDINAL** name for the last object of this set.

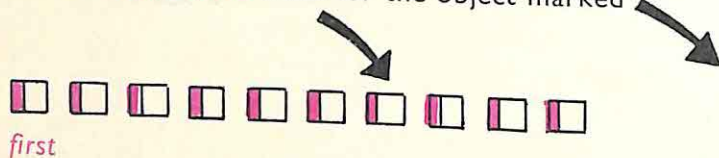


- 60 Fourth is the **o** * * * * * name for the last object of this set.



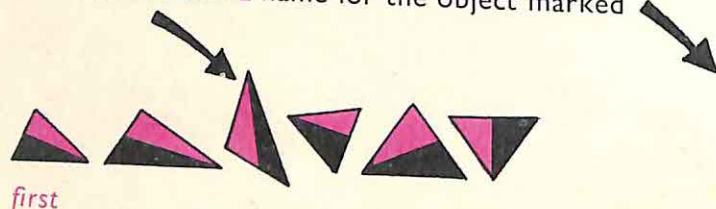
39
EIGHTH

- 61 Give the **ORDINAL** name for the object marked



40
ORDINAL

- 62 Give the **ORDINAL** name for the object marked



61
SEVENTH

- 63 Give the **ORDINAL** name for the last object of each set.

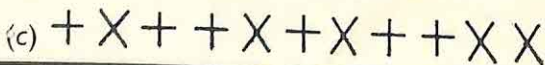


cardinal name

five



nine



eleven

62
THIRD

64

Which is the fourth object of this set of cardinal six?



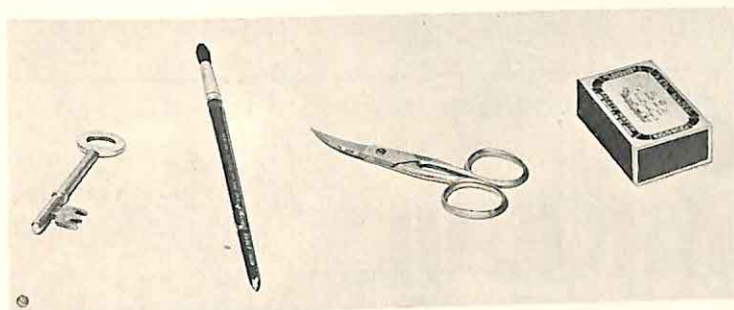
first

63

- (a) FIFTH
(b) NINTH
(c) ELEVENTH

65

Which is the second object in this set of cardinal four?



first

64

OR
JUG

65

OR
PAINT BRUSH

1845

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Revision I

Frames 66 to 74 are revision frames. Write down your answers to the questions on a separate sheet of paper. (The correct answers are at the back of the book. Turn to them only after you have completed all the revision frames.)

- 66 You can tell at a glance the number of things there

are here: 

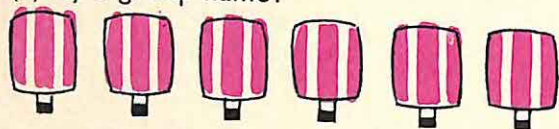
but not here: $X + + X + X X + + + X X + +$

You rely on your _____ to do this.

- 67 Would primitive man have called these things—

(a) six?

(b) by a group name?



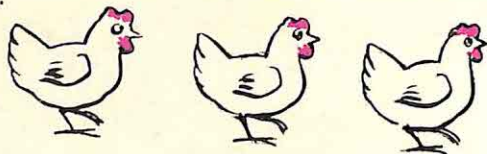
- 68 Write these things with their correct group names:

flowers — library

ships — bunch

books — fleet

- 69 A man has these hens.

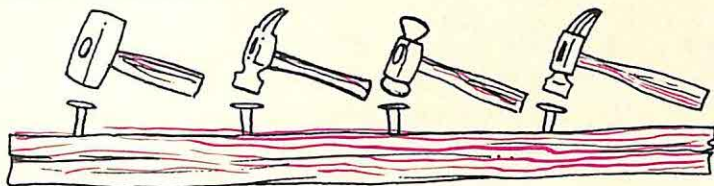


He matches them with these stones.

We call this matching a _____



- 70 Is there a one to one correspondence between the set of hammers and the set of nails?



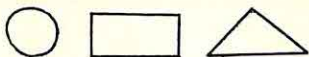
- 71 We give the number name "five" to this set of objects.



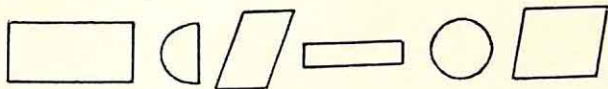
Is the word "five"—

- (a) **ORDINAL**?
(b) **CARDINAL**?

- 72 Give the **CARDINAL** name for this set of things.



- 73 What is the **ORDINAL** name for the last object of this set of things?



- 74 APRIL is the fourth month of the year.
Is the word "fourth"—
- (a) **CARDINAL**?
(b) **ORDINAL**?
(c) **GROUP**?

Now continue with the programme.



- 75 While early man in England was still using group names, two nations had further developed their number sense and wrote numerals. Look at the map and name the two nations.
- 76 Which of these two nations is still called by the same name today?

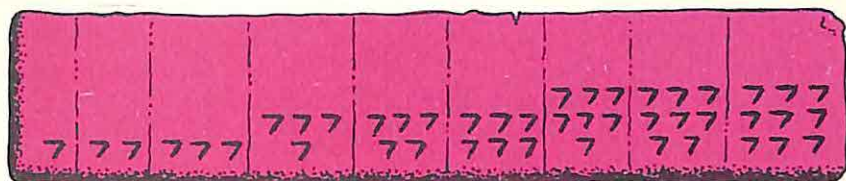
- 77 The people of Egypt are called **EGYPTIANS** and the people of Sumer are called **SUMERIANS**. Write down the names of these two peoples.

- 78 Near which sea marked on the map did the Egyptians and the Sumerians live?

75
EGYPT
SUMER

76
EGYPT

77
EGYPTIANS
SUMERIANS



SUMERIAN NUMERALS

79 The Sumerians wrote on slabs⁹ of wet clay with a wedge-shaped tool.

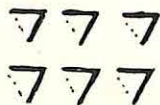
The Sumerians used a wedge-shaped tool and wrote on * * * * *

80 Draw the Sumerian numeral which has a one to one correspondence to five.

81 Have all the Sumerian numerals one to nine, a one to one correspondence?

82 Draw the Sumerian numeral four.

83 What is this Sumerian numeral?



84 Draw the Sumerian numeral eight.

78
MEDITERRAN-
EAN SEA

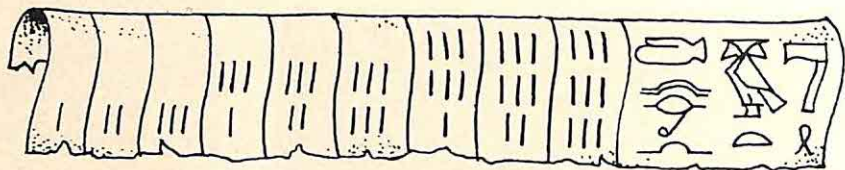
79
SLABS OF
WET CLAY

80
777
77

81
YES

82
777
7

83
SIX



EGYPTIAN NUMERALS

- 85 The Egyptian numerals one to nine were similar to the Sumerian, but the Egyptians wrote on plaited papyrus reeds with a brush and black paint.

The Egyptians wrote on papyrus reeds using a

***** and ***** *****.

84



- 86 Like the Sumerian numerals, each Egyptian numeral one to nine resembled a one to one *****.

85

BRUSH:
BLACK PAINT

- 87 This Egyptian numeral is *****.



86

CORRESPONDENCE

- 88 Draw the Egyptian numeral five.

87

THREE

- 89 This Egyptian numeral is *****.



88



- 90 Draw the Egyptian numeral nine.

89

SEVEN

- 91 Man used his fingers to match or correspond with things.

If you used the fingers of both hands, how many things could you match or correspond?



- 92 When one man had used all his ten fingers to match or tally objects, a SECOND MAN raised ONE FINGER TO REPRESENT THE FIRST MAN'S TEN FINGERS. If the second man raised one finger, how many objects would it represent?

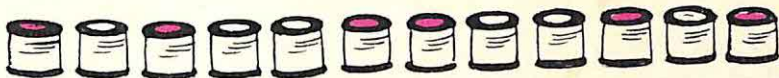
91
TEN

- 93 Would it need two men's fingers to represent these objects?



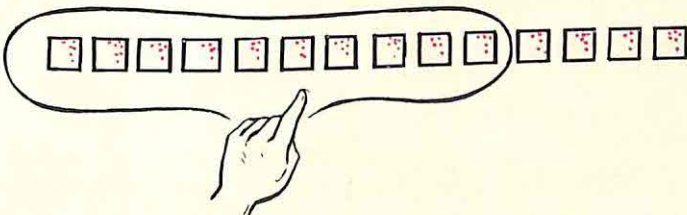
92
TEN

- 94 Would it need two men's fingers to represent these objects?



93
NO

- 95 Here are fourteen objects. The second man represents TEN of them with one finger.



How many fingers will the *first* man show?

94
YES

- 96 Here are some objects.



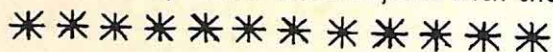
This finger of the second man represents ten of them.



Draw the number of fingers the *first* man will show.

95
FOUR

- 97 Two men represent these objects with their fingers.

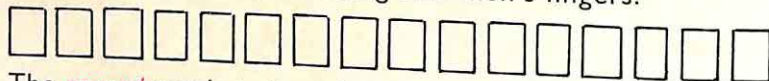


Which man will show these fingers—

- (a) the first man?
(b) the second man?



- 98 Represent these objects using two men's fingers.



The *second* man's is done for you.

2nd man



1st man

97
(d) FIRST MAN

- 99 Draw two men's fingers to represent these objects.



98



100 Draw crosses represented by these fingers.



2nd man



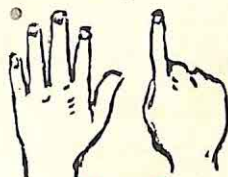
1st man



101 Draw circles represented by these fingers.



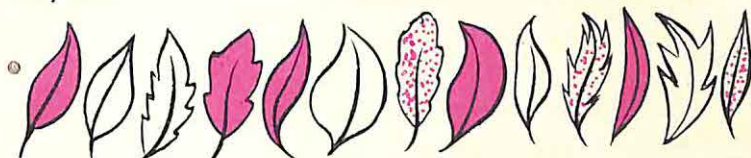
2nd man



1st man



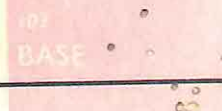
102 Draw the fingers of two men to represent these objects.



103 This particular use of fingers is called **WORKING WITH A BASE**. The **BASE** is the number of things counted in a group before it is shown in another way. When man used his fingers in this manner he worked on a **b * * *** of ten.



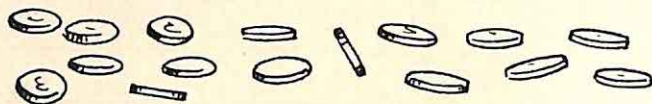
104 If we change pennies to shillings we collect twelve pennies to make one shilling.
If we change pence to shillings we work on a *** * * *** twelve.



105 If we change shillings to pounds we work on a base * * * * *.

104
BASE

106 Here are some pennies.



Change them to shillings using a base twelve.

105
TWENTY

107 What base do we use to change inches to feet?

106
1s. 4d.
(ONE, FOUR)

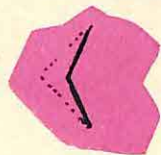
108 What base do we use to change ounces to pounds?

107
TWELVE

109 Many bases are used, but the most frequent is TEN. This results from the fact that man has ten fingers. If man had had TWELVE fingers, which base might have been most popular?

108
SIXTEEN

110 From the numerals below it can be assumed that the Sumerian people used a base ten. They wrote corresponding strokes for numerals one to nine, but ten was written thus:

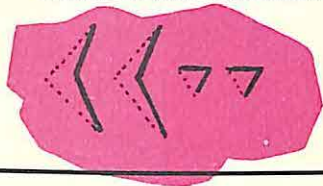


What is this Sumerian numeral?



109
TWELVE

111 What is this Sumerian numeral?

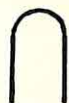


110
THIRTEEN

112 Write the Sumerian numeral for eighteen.

111
TWENTY-TWO

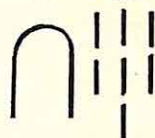
113 The Egyptian numeral for ten was:



Do you think the Egyptians knew base ten?



114 What number does this Egyptian numeral represent?



112
YES

115 Write twenty-six in Egyptian numerals.

113
SEVENTEEN

116 Sumerian and Egyptian numerals show the use of base ten.

These SYRIAC numerals show the use of base TWO.



Write the Syriac numerals for "one", "two" and "three".

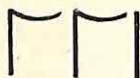


- 117 This map shows where SYRIA is.



Was Syria a country near to Egypt and Sumer?

- 118 What number does this Syriac numeral represent?



- 119 Write "four" in Syriac numerals.

- 120 When two men's fingers were used for counting it was called "working with a —".

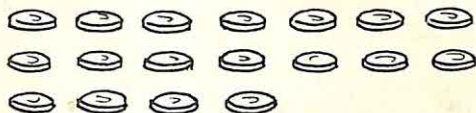
- 121 People worked with different bases, but the most common base is * * * because man has this number of fingers.

- 122 The numerals of early races showed they used various bases.

What base do we assume the Syriac people used from these numerals?

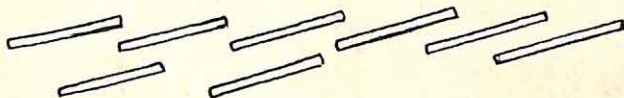


- 123 We use base twelve to change pence to shillings.
Change these pence to shillings and pence.



122
TWO

- 124 We use base three to change feet to yards.
Change these feet to yards and feet.



123
1s. 6d.
(ONE: SIX)

- 125 Change these pints to gallons using base eight.

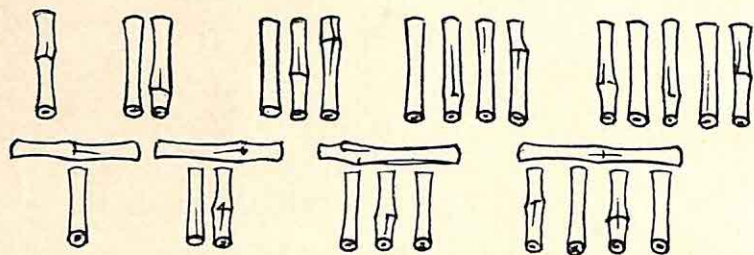


124
2 yds. 2 ft.
(TWO: TWO)

- 126 Besides using numerals man invented APPARATUS to
record and count his things.

Man wrote numerals and also used * * * * * to
record and count his things.

125
1 gall. 5 pts.
(ONE: FIVE)



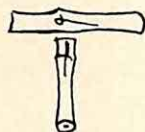
CHINESE BAMBOO RODS

127 The early Chinese used apparatus known as BAMBOO RODS.

What apparatus did the early Chinese use?

126
APPARATUS

128 The Chinese bamboo rods shown above are set out to show the numerals one to nine. Which numeral do these Chinese bamboo rods represent?

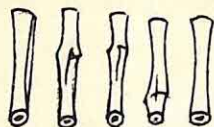


127
BAMBOO RODS

129 Show the arrangement of bamboo rods for "seven".

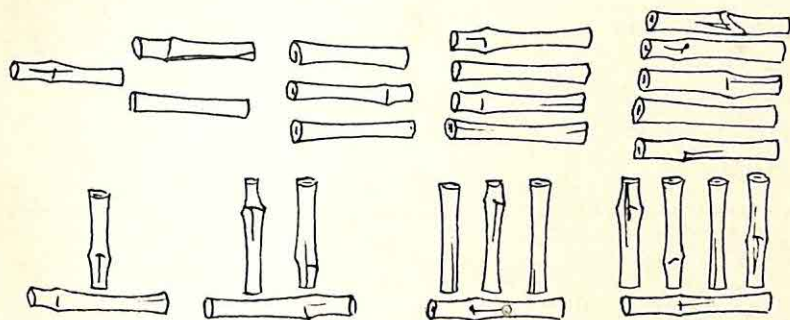
128
SIX

130 Which numeral do these bamboo rods represent?



131 Show the arrangement of bamboo rods for "nine".

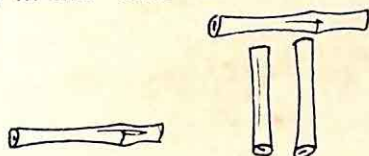
130
FIVE



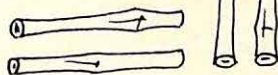
CHINESE BAMBOO RODS

- 132 For numbers bigger than nine the Chinese laid two columns of rods to represent their numerals. The rods were laid differently in the "tens" column.

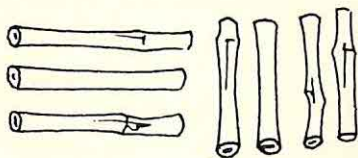
Seventeen was



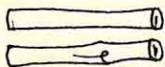
Twenty-two was



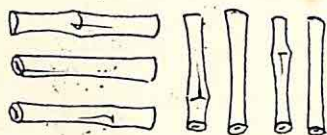
What number do these bamboo rods represent?



- 133 Represent twenty-one with Chinese bamboo rods. The "tens" column is done for you.



134. Do these bamboo rods represent—

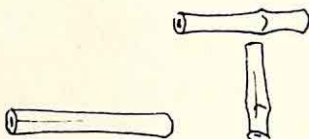


- (a) forty-three?
(b) thirty-four?
(c) seven?

134



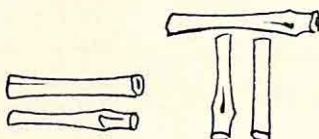
135. What number do these bamboo rods represent?



135

(b) THIRTY-FOUR

136. What number do these bamboo rods represent?



136

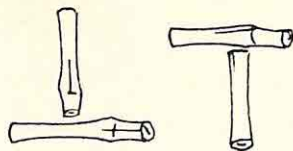
SIXTEEN

137. Represent thirty-eight with bamboo rods.

137

TWENTY-SEVEN

138. These bamboo rods represent sixty-six.

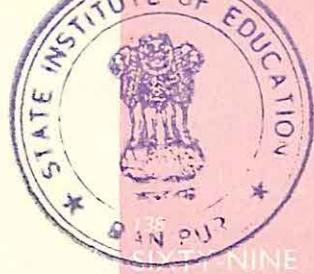


What number do these bamboo rods represent?

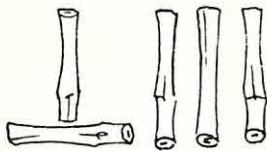


138



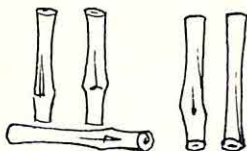


- 139 What number do these bamboo rods represent?



- 140 Draw bamboo rods to represent eighty-one.

- 141 What number do these bamboo rods represent?



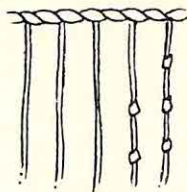
- 142 Draw bamboo rods to represent seventy-eight.

- 143 The Inca people of Peru used a QUIPU to record the number of things they had.
Write down the word QUIPU.

- 144 Which race of people used the QUIPU—
(a) Chinese?
(b) Egyptians?
(c) Incas of Peru?

- 145 The quipu was made of strings fastened to a main string. Knots were tied in the strings to represent objects.

On base ten, twenty-three is represented here.



This frame is continued on the next page.

139
SIXTY-THREE



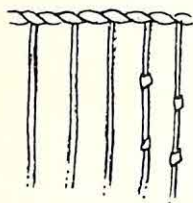
142
SEVENTY-TWO



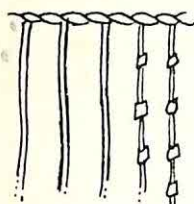
143
QUIPU

144
(c) INCAS OF PERU

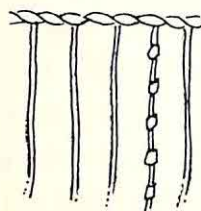
How many objects are represented here?



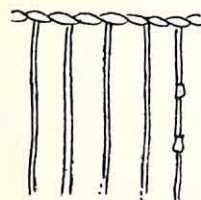
- 146 On base ten, how many objects are represented here?



- 147 Draw this quipu and knots to represent fifty-one. The tens column is done for you.

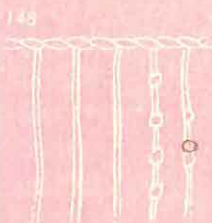


- 148 Draw a quipu and knots to represent forty-two. The units column is done for you.

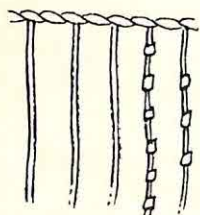


145
TWENTY-TWO

146
THIRTY-FOUR



- 149 Does this quipu represent—
(a) thirty-six?
(b) sixty-three?
(c) nine?



150 Draw a quipu to represent thirty-five.

149
SIXTY-THREE

151 Draw a quipu to represent fifty-seven.



152 Is this statement true or false?
The Inca people of Peru used apparatus called bamboo rods.



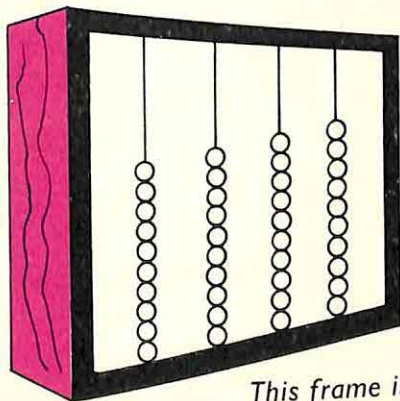
153 Is this statement true or false?
The Incas of Peru used apparatus called a quipu made of strings and Chinese people used bamboo rods.

152
FALSE

154 Many early races used an **ABACUS** to record their objects. There were many types of **ABACUS**.
Write down the word: **ABACUS**.

153
TRUE

155 Here is one type of abacus. It is a wooden frame with beads on wire. It is laid flat.



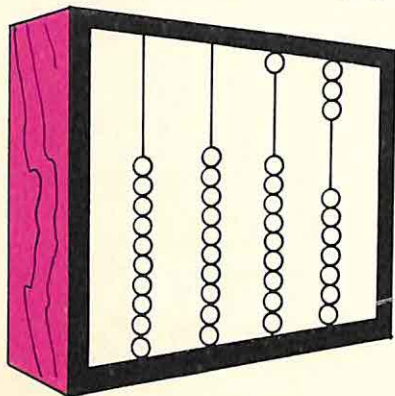
This frame is continued on the next page.

154
ABACUS

There are ten beads on each wire. The ten beads on the right hand wire are represented by one bead on the next wire.

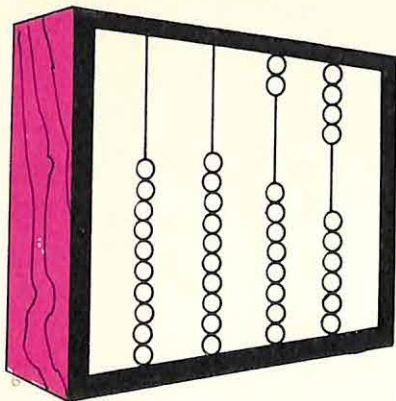
The beads are moved to the "top" of the wire.

- 156 This abacus is recording "thirteen", one on the "tens" wire and three on the "units" wire.



What is the name of this counting apparatus?

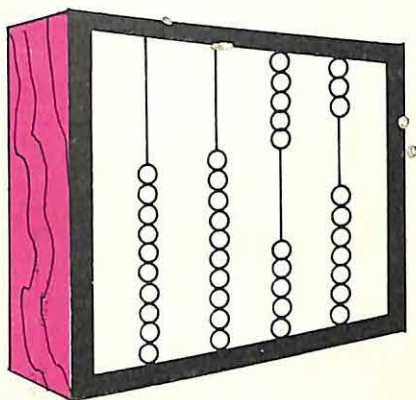
- 157 This abacus records twenty-four. Two beads have been moved on the "tens" wire and * * * * on the "units" wire.



158

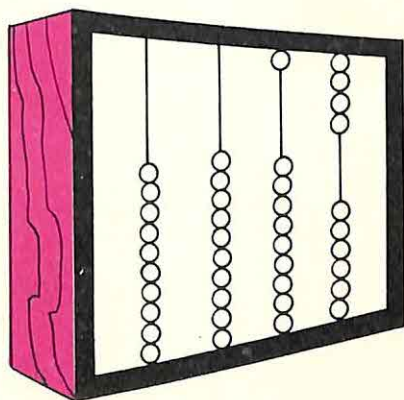
Does this abacus record—

- (a) thirty-four?
- (b) thirty-five?
- (c) fifty-three?

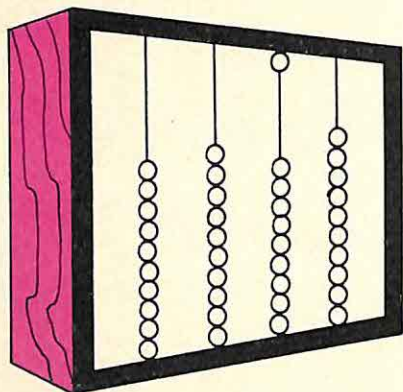
157
FOUR

159

What is recorded on this abacus?

158
(c) FIFTY-THREE

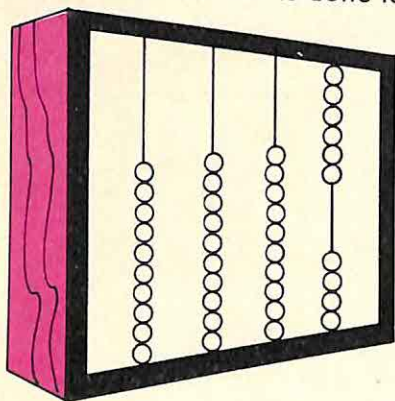
- 160 Draw an abacus recording fifteen.
The "tens" column is done for you.



159

FOURTEEN

- 161 Draw an abacus recording thirty-six.
The "units" column is done for you.



160



- 162 Draw an abacus with twenty-eight recorded.

161



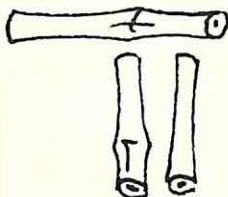
162



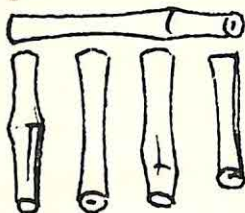
Revision 2

Frames 163 to 169 are revision frames. Write down your answers to the questions on a separate sheet of paper. (The correct answers are at the back of the book. Turn to them only after you have completed all the revision frames.)

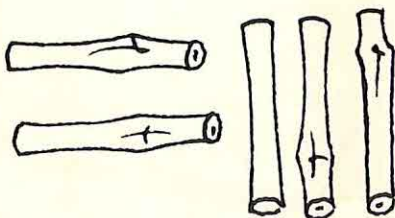
- 163 This apparatus was used by the Chinese.
It is called **CHINESE** _____.



- 164 What number is recorded here?



- 165 What number is recorded here?

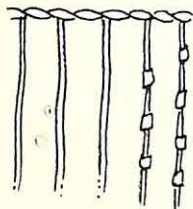


- 166 These mixed-up letters give the name of apparatus used by the Incas of Peru.

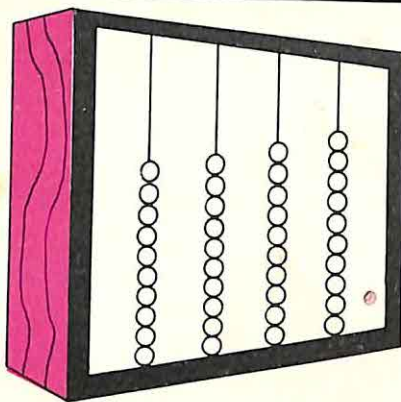
P I U U Q

Write the name of the apparatus.

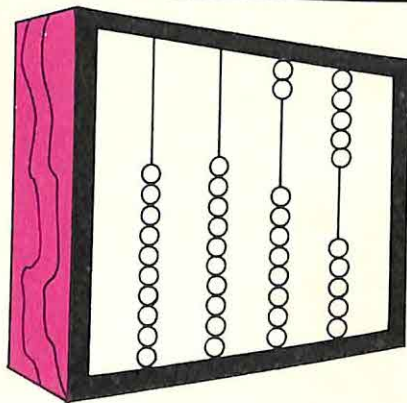
- 167 What number is recorded here?



- 168 Many early races used this apparatus. It is an _____.



- 169 What number is recorded on this abacus?



Now continue with the programme.

170 Although our present-day number symbols, or figures, are called ARABIC, they originated in INDIA. Where did our present-day number symbols originate?

171 The name ARABIC comes from the country Arabia. What are our present-day figures called—

- (a) English?
- (b) Arabic?
- (c) Indian?



172 The map shows how our number symbols reached us. Write down the names of the countries through which our number symbols came to us.

173 The Indians were the first people to use a limited number of symbols to make all numerals. Our number symbols are

0 1 2 3 4 5 6 7 8 9

Write them down.

174

The Indian symbols looked something like this.

• १ २ ३ ४ ५ ६ ७ ८ ९

0 1 2 3 4 5 6 7 8 9

Write the Indian symbols for four, seven and nine.

173

0 1 2 3 4

5 6 7 8 9

175

The Arabs used the Indian symbols, but they wrote them something like this.

• ١ ٢ ٣ ٤ ٥ ٦ ٧ ٨ ٩

0 1 2 3 4 5 6 7 8 9

Write the Arabic symbols for four, seven and nine.

174

٤ ٧ ٩

4 7 9

176

When the symbols first came to Britain we wrote them something like this.

0 1 2 3 4 5 6 7 8 9

0 1 2 3 4 5 6 7 8 9

Write the early English numerals for four, seven and nine.

175

٤ ٧ ٩

4 7 9

177

Is this statement true or false?

Our present-day numerals are called Arabic but originated in India.

176

٤ ٧ ٩

4 7 9

- 178 Whichever numerals we write we use only these symbols.

0 1 2 3 4 5 6 7 8 9

Write these in figures—

- (a) twenty-six;
- (b) sixty-two;
- (c) eighty-nine;
- (d) ninety-eight.

177
TRUE

- 179 How many symbols do we use to be able to write all our numerals?

178
26; 62; 89; 98

- 180 Although we use only these figures, their value alters according to the place in which they are written. There is one figure common to all these numerals. Write it.

15
56
592
325

179
TEN

- 181 The position of a figure in a numeral gives it its PLACE VALUE. Write down the words PLACE VALUE.

180
5

- 182 15. The value of 5 in this numeral is "five".
56. The value of 5 in this numeral is "fifty".
68. What is the value of 6 in this numeral?

181
PLACE VALUE

- 183 In which of these numerals has 4 the biggest value—
(a) 974?
(b) 426?
(c) 843?

182
SIXTY

184 Is this statement true or false?
In the numeral 29578, the figure eight has a bigger value than the figure five.

183
(b) 426

185 We often use the symbol 0. This is called ZERO.
What name do we give to this symbol?
0

184
FALSE

186 If we say we have ZERO do we have anything?

185
ZERO

187 The symbol 0 used in a numeral has no value in itself.
It only gives PLACE VALUE to other figures.
Is there a difference between 470 and 47?

186
NO

188 The figure zero is only used to give * * * * * to a numeral.

187
YES

189 The position of a figure in a * * * * * gives it its place value.

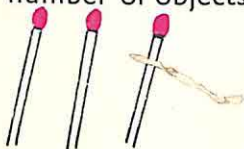
188
PLACE VALUE

Frame 189 is the last frame of the programme. Now that you have answered it, turn to the next page and work the post programme test.

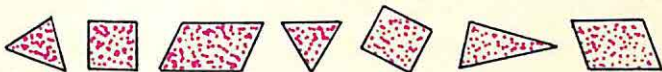
189
NUMERAL

Post programme test

- 1 What do you rely on to tell, without counting, the number of objects there are here?

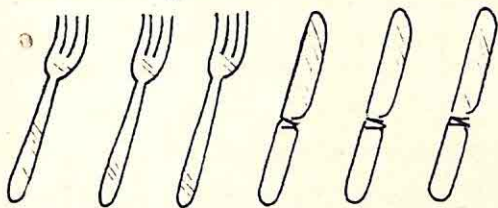


- 2 Would primitive man have called these things—

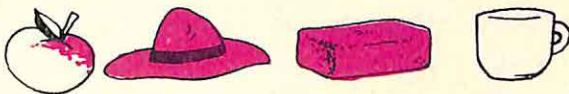


- (a) by a group name?
(b) seven?

- 3 These knives match with these forks. We call this matching a _____.



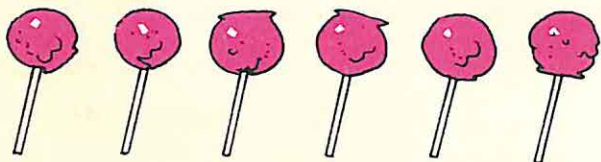
- 4 Here is a set of four things.



We say this is a set of—

- (a) ordinal four?
(b) cardinal four?
(c) group four?

- 5 Objects can be named in an order of things. The last object here is the sixth.



The word "sixth" is an _____ number name.

- 6 Which early race wrote on slabs of wet clay with a wedge-shaped tool?

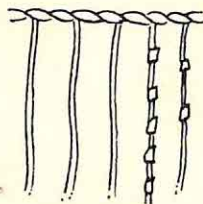
- 7 Name another early race whose people wrote their numerals one to nine in a one to one correspondence, using black paint.

- 8 When one man had used all his ten fingers to represent objects, a second man raised one of *his* fingers to represent that ten. We call this: "working with a _____."

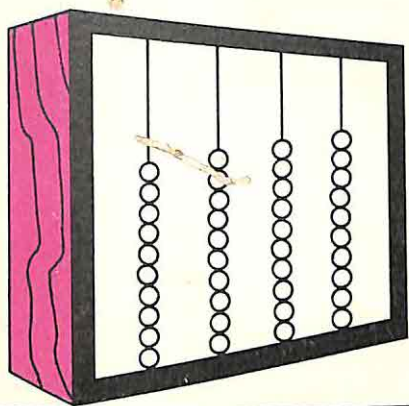
- 9 What base do you use when changing inches to feet?

- 10 What apparatus did the Chinese use to count and record things in ancient times?

- 11 What numeral is represented on this quipu?



- 12 Name this counting apparatus.



- 13 Did our present-day numerals originate from—
(a) China?
(b) Arabia?
(c) India?

- 14 We use ten figures to make all our numerals. The position of a figure in a numeral gives it its _____.

- 15 Which figure in a numeral has no value in itself and only gives place value?

Now turn to the next page and do the post programme work. You may use the programme to help you.

Post Programme Work

- 1 We use the group name "herd" for a lot of cattle. Write down the correct group name for a lot of the following:

Fish — pack; shoal; pride.

Keys — herd; bunch; crowd.

Ladies — bevy; school; pack.

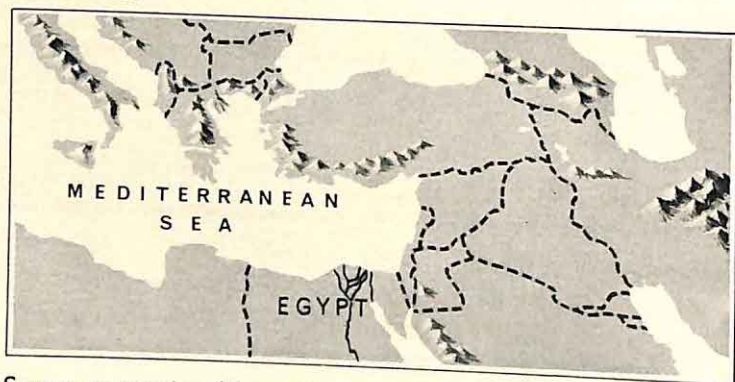
Trees — menagerie; set; clump.

Books — cabinet; library; room.

We use words such as "pile", "row", "club", and so on as other group names.

Using a dictionary, encyclopaedia, or other books, compile a list of group names and the things they refer to.

- 2 This is a sketch map of the Eastern Mediterranean countries.



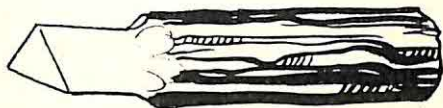
Some countries (Egypt is one of them) have kept their names from earliest recorded times. The names of other countries have changed. Look at an historical atlas, or at books about ancient history or art. Perhaps there are maps at the back of your Bible. Find the names of the countries in the Eastern Mediterranean area which have changed their names. From an atlas, trace a map of this area and show these countries on it.

- 3 The Egyptians used a brush and black paint to write their numerals. We buy paint or ink from a shop if we wish to paint or write. Make your own paint from soot, clay or any other natural substance. Add glue to it and write Egyptian numerals on paper with a brush.

- 4 If you have some clay, roll out a slab about $\frac{1}{2}$ inch thick and make it rectangular in shape.



Cut a length of wood and shave the end to a triangular shape as shown.



On the slab make Sumerian numerals, then write a short booklet explaining these numerals.

- 5 Your village, town, or city is made up of sets of streets, roads, avenues, and so on. Each street is made up of a number of houses. Each house is numbered. Take, say, the 42nd house in each street or road and do one of two things.

- (a) Find the name of the person living there.
OR (b) Give the colour of the downstairs curtains in the house.

List your findings on a chart.

There are other similar projects you can do with streets and houses. Think out some and do them.

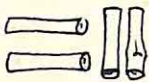
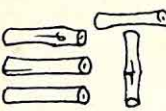
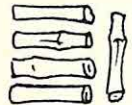
6

Gather some twigs and cut them into three inch lengths.

Use them as Chinese bamboo rods.

List things in the classroom (desks, cupboards, window panes, etc.) by using the Chinese bamboo rod method of recording.

e.g.

Boys in class	
Books on shelf	
Bottles of milk	

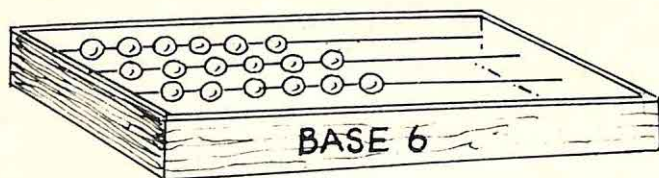
7

Make an abacus. Use a stocking or shoe box, thread and some beads or buttons.

Choose a base for your abacus; it need not be base 10.

Write the base you are using on the side of the box.

Have three strings and thread the beads or buttons on them. Fix the strings to the box.



Record objects on your abacus, using your own base.




8

The figures we use today for all our numerals are:

0 1 2 3 4 5 6 7 8 9

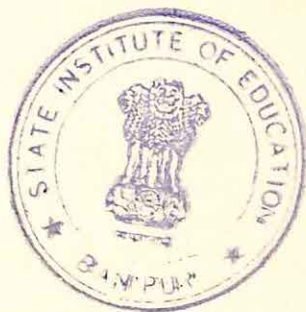
Make up a symbol of your own for each figure and do simple calculations using them.

e.g. If 1 is , 3 is *N* and 5 

then *N* x  =  

Most countries use similar figures to ours; similar in the sense that there are the same number of them and that similar mathematical operations are done with them.

Try to find out what the German, Italian and present-day Chinese figures look like. Compare them with ours.



Answers

Revision 1

- 66 number sense
- 67 (b) by a group name
- 68 flowers — bunch
ships — fleet
books — library
- 69 one to one correspondence
- 70 yes
- 71 (b) cardinal
- 72 three (3)
- 73 sixth
- 74 (b) ordinal

Revision 2

- 163 bamboo rods
- 164 nine (9)
- 165 twenty-three (23)
- 166 quipu
- 167 thirty-four (34)
- 168 abacus
- 169 twenty-five (25)

Post programme test

- 1 number sense
- 2 (a) by a group name
- 3 one to one correspondence
- 4 (b) cardinal
- 5 ordinal
- 6 Sumerians
- 7 Egyptians
- 8 base
- 9 twelve (12)
- 10 bamboo rods
- 11 fifty-two (52)
- 12 abacus
- 13 India
- 14 place value
- 15 zero



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